

**SUMMARY HIGHLIGHTS OF THE  
U.S. DEPARTMENT OF ENERGY/U.S. NUCLEAR REGULATORY COMMISSION  
TECHNICAL EXCHANGE ON PRE-LICENSING ACTIVITIES  
AND LEVEL OF DESIGN DETAIL  
FEBRUARY 3-4, 2004  
LAS VEGAS, NEVADA**

**INTRODUCTION**

The U.S. Nuclear Regulatory Commission (NRC) and U.S. Department of Energy (DOE) held a public technical exchange on Pre-licensing Activities and Level of Design Detail on February 3-4, 2004 in Las Vegas, Nevada. The meeting was held at the Bechtel SAIC offices in Las Vegas. The agenda for this meeting can be found in Attachment 1.

To support staff and stakeholder interactions, the Technical Exchange included video connections at NRC offices in Rockville, Maryland and at the Center for Nuclear Waste Regulatory Analyses in San Antonio, Texas. Audio connections were also made available.

Participants included representatives of the NRC, DOE, State of Nevada, Affected Units of Local Government, Native American Tribes, Naval Nuclear Propulsion Program, Nuclear Energy Institute, and members of the public. Attachment 2 contains the list of attendees who were present at the above noted locations. Attachment 3 contains the slides presented by DOE and NRC.

**OPENING REMARKS**

The NRC stated that the purpose of the meeting was to discuss the content of DOE's proposed license application for a geologic repository at Yucca Mountain, Nevada, and NRC's risk-informed approach for review of the license application.

The DOE noted that its objectives for the meeting were to:

- Establish a basis for agreement on the level of detail DOE will provide in the license application (LA) and, in particular, the level of design information to support pre-closure and post-closure safety analyses,
- Describe the differentiated approach DOE will take between the level of detail in the LA submitted for a construction authorization (CA) and additional information in updates to the LA for a license to receive and possess waste to support NRC findings required at each decision point, and
- Show that the design information provided in the LA will cover the entire facility design basis in sufficient detail to support the preclosure and post closure safety analyses.

ENCLOSURE

The DOE stated that it had provided its position on the level of design detail needed in the LA in May 2000 to support discussions with NRC on analysis of pre-closure safety. That position was based on the two stage licensing process described in 10 CFR Parts 60 and 63 (a decision on CA followed by a decision on a license to receive and possess waste). It also relied on differentiation between information provided in the LA and additional information in updates to the LA for a license to receive and possess waste, while providing information sufficient for NRC safety determinations at each decision point. The DOE stated that this position was consistent with NRC licensing precedent for two-stage licensing of complex facilities (e.g., reactor licensing under 10 CFR Part 50).

The DOE stated that the level of design detail in the LA must provide sufficient information to support the evaluations that demonstrate compliance with pre and post-closure performance objectives for the repository system and demonstrate compliance with other NRC requirements. The update of the LA for a license to receive and possess waste will provide additional or updated design information needed to confirm or support any updates of Preclosure Safety Analysis (PCSA) and Total System Performance Assessment (TSPA) and for NRC to make the safety determination required for issuance of a license.

The DOE stated that the information in the LA will be based on and supported by various design products. The design products themselves will not generally be in the LA, but portions and summaries of the products will be included as appropriate in a stand-alone LA to support the case for compliance with NRC performance objectives and other licensing requirements.

The DOE noted that the pre and post-closure safety analyses and inputs to those analyses provide the basis for classification of engineered structures, systems, and components (SSCs) as either Important To Safety (ITS) or Important To Waste Isolation (ITWI), or not important to safety or waste isolation. For each SSC ITS or ITWI, information will be included in the LA to support the regulatory design basis and address Yucca Mountain Review Plan (NUREG-1804) acceptance criteria. This information will include: applicable design codes and standards; design criteria and regulatory design bases; general system description; and information on dimensions, material properties, specifications, analytical and design methods used in design. Additional information will be provided in the LA as appropriate and necessary to support the PCSA. Such information may include: general arrangement drawings; handling diagrams; piping and instrumentation diagrams; and electrical one line diagrams. The DOE stated that a general description of non-safety SSCs will be included in the LA that is sufficient to demonstrate the basis for non-Q classification (e.g., no credit taken and no adverse effect on ITS or ITWI systems).

The DOE summarized by stating that it must and will show that the repository will meet performance objectives specified in 10 CFR Part 63.

## PRESENTATIONS AND DISCUSSION

### Content of License Application

The DOE reviewed the various licensing processes regulated by NRC (e.g., 10 CFR Part 50, 10 CFR Part 70, and 10 CFR Part 72) noting that they varied between one-stage and two-stage licensing processes; the difference is that a two-stage process allows the applicant to update its LA after construction begins but prior to receiving a license to receive and possess high-level waste (HLW). The DOE believes a two-stage process (e.g., 10 CFR Part 50) is similar to 10 CFR Part 63 in that 10 CFR Part 63 requires the LA to be updated after a construction authorization is granted but prior to NRC issuing a license to receive and possess HLW.

The DOE presented a general description of the types and amount of information that would be provided in the LA and later in the updates to LA for the license to receive and possess waste. The LA and additional information in updates to the LA for a license to receive and possess waste would contain sufficient information for the full set of facilities and inventory to demonstrate compliance with regulatory requirements to support decisions on a construction authorization and a license to receive and possess HLW, respectively.

The NRC asked several questions regarding DOE's process to control and update design and programmatic information contained in the LA. The questions focused on understanding the types of information that would be updated and enhanced between granting a construction authorization and obtaining a license to receive and possess HLW. The DOE responded that at each stage the LA will be a stand-alone document and the supporting documents will be available for licensing review and inspection. The safety analysis report (SAR) in the LA will extract appropriate information from supporting documents to demonstrate compliance with NRC performance objectives and other licensing requirements.

### Safety Analysis Report (SAR) Outline

The DOE provided a detailed chapter-by-chapter outline of the LA, including the General Information section and the SAR. The presentation included specific information that would be included in the SAR for each SSC ITS. Also presented was a portion of the matrix that will be used to trace information contained in the SAR to the requirements of 10 CFR Part 63 and the Yucca Mountain Review Plan (NUREG-1804).

The DOE also presented its perspective on the similarities in the licensing review process between 10 CFR Part 50 and 10 CFR Part 63. The NRC acknowledges that DOE may utilize lessons learned from past licensing experiences; however, DOE must meet the requirements for CA contained in 10 CFR Part 63.

## Stakeholder Comments and Questions

Steve Frishman, State of Nevada Agency for Nuclear Projects, requested clarification on the difference between drawings that will be contained in the SAR and drawings that would be used for construction. The DOE responded that construction drawings contain a lot more detail (e.g., the location of reinforcing bar in a concrete structure) to ensure that the SSC is built or fabricated to the conditions set forth in the SAR. Mr. Frishman noted that very little of the facilities would be constructed when only the construction authorization is in place. Because of the planned staged construction, most of the construction would take place when the initial facilities were in operation. The DOE responded that the potential impact of staged construction on repository operations will be discussed in the SAR.

Judy Treichel, Nevada Nuclear Waste Task Force, stated that, with regard to waste packages and other engineered systems, she was troubled that DOE appeared to be more focused on preventing a release of radioactive material and not as focused on mitigating a release. Ms. Treichel also expressed concern about the fact that DOE was not providing all design information for a construction authorization, which she said was analogous to using the term “closed-pending” in describing the status of key technical issue (KTI) agreements, in that DOE and NRC were postponing final action.

## SAR Level of Detail

The DOE made four presentations as part of this agenda topic: 1) an introduction to engineering documentation; 2) design of the surface facilities; 3) design of the subsurface facilities; and 4) design of the waste package and the drip shield. In addition, DOE addressed previous comments submitted by NRC resulting from the staff’s review of information for an example heating, ventilation, and air conditioning (HVAC) system.

The DOE reviewed its hierarchy of engineering documentation and identified which documents would be summarized in the LA and which documents were considered as supporting information that would not be submitted with the LA but would be made available for NRC review and inspection. The DOE noted that it believed that some confusion existed between NRC’s use of the term “specification” and DOE’s use of the same term. The NRC clarified that it used the term to describe more general information (e.g., material properties) as opposed to DOE’s use of the term to describe the type of information that would be supplied to a vendor or supplier when purchasing items.

The DOE next provided an overview of the design of the surface facilities including a work process flow of how HLW would be accepted, packaged, and emplaced in Yucca Mountain. The facilities included a canister handling facility, a dry transfer facility, and an aging facility. The mechanical handling operations used at the facilities were designed based on Cogema’s process experience from the La Hague reprocessing facility in France. The presentation included several design drawings (e.g., piping and instrument diagrams, single line electrical drawings, mechanical block flow diagrams, and 3D computer aided design models) and work flow diagrams to illustrate the level of design detail that would be included in the LA.

The DOE stated that on January 27, 2004 it authorized incorporation of an additional surface facility into the baseline design for the LA. This will be a facility with the capability to handle uncanisterized spent commercial nuclear fuel as well as canisterized waste. The DOE noted that once the design information is developed, the facility will be included in the PCSA for the LA.

In response to an NRC question on characterization of the area where surface aging facilities would be located, DOE responded that a program to supplement the initial investigations that will be described in the LA is being developed. In response to an NRC concern on facility shielding, DOE stated that the LA will demonstrate compliance with 10 CFR Part 20 during normal operations but that shielding used to meet these requirements was not ITS. NRC requested that DOE provide clarification about the process and criteria used to make ITS determinations in discussing preclosure safety issues at a future meeting.

The NRC asked several questions regarding the workflow and other processes associated with the surface facilities.

The DOE described the layout of the subsurface facilities, including the drift placement and ventilation requirements during the preclosure phase of the repository. The emplacement drifts will be constructed in a phased approach which will allow repository operations to begin while emplacement drifts are still under construction. A description was provided of how construction activities will be controlled once the facility begins operation. A description was also provided of the ground support system for the emplacement drifts.

The emplacement operations and equipment were described. The NRC questioned why the waste package transporter and emplacement gantry were classified as ITS, while the transportation locomotive was classified as not ITS. Based on the ensuing discussion, it was agreed that NRC concerns about the dual classification for some SSCs as both ITS and not ITS should be addressed as part of a future meeting regarding ITS determinations.

The DOE described the design of the waste package and drip shield including the functional and operational requirements of the components. The waste package is classified as both ITS and ITWI. Ten configurations of the single waste package design will be described in the LA. Four of the configurations, which encompass the range of configurations and cover the majority of the waste inventory, will be described in greater detail in the LA to demonstrate that the application of the design methodology, design bases, and design criteria satisfy the requirements of 10 CFR Part 63. More detail on the remaining 6 configurations will be described when DOE updates the LA for the license to receive and possess HLW.

The DOE will begin procurement of prototype waste packages this year. The prototypes will be used to identify qualified fabricators, refine fabrication techniques, and develop operational techniques (e.g., welding and non-destructive testing). The NRC staff requested that DOE keep them informed of the prototype fabrication schedule to allow the staff to perform observations and inspections of the activities. In response to an NRC question, DOE stated that it will commit in the LA to repackaging waste rather than emplacing waste packages that may have been significantly damaged due to a drop or other accident. For waste packages that may receive minor damage during handling or as a possible result of rock fall prior to drip shield emplacement, the LA will commit to an inspection and decision process to determine if remediation of the waste package or repackaging is necessary.

The DOE presented its response to NRC comments on the example provided by DOE for the level of detail to be presented in the SAR for the HVAC system of a hypothetical dry transfer facility. The DOE provided the level of detail example to NRC in September 2003 and NRC provided its comments in December 2003. The HVAC system was classified as not ITS by DOE; however, NRC reviewed and commented on the level of detail as if the HVAC system had been classified as either ITS or not ITS. The DOE noted that the full text of the SAR would have addressed most of the NRC comments.

The NRC questioned why DOE only provided justification for classifying SSCs as ITS but did not document the reasoning why some SSCs were classified as not ITS. The DOE responded that it did not believe it was necessary; however, DOE would make information available to NRC during the staff's review of the LA to support DOE's decision on classifying SSCs not ITS. The DOE noted that the process of identifying and evaluating event sequences for consideration in the PCSA provides a basis for screening SSCs and identifying those that are ITS as well as those that are not. The NRC and DOE discussed the need to conduct a near-term public meeting to discuss this topic in more detail.

#### Risk-Informed Approach to Reviewing the Yucca Mountain License Application

The NRC presented an overview on the staff's approach to risk-inform its review of the proposed LA. The presentation provided examples of how the staff would use risk information to assess both preclosure and post closure conclusions reached in the LA. The NRC noted that although the results of an overall performance evaluation (e.g., dose) are required for comparison with numerical performance objectives, the intermediate results of analyses and results from sensitivity and uncertainty analyses provide a more complete understanding of system behavior and barrier capability. The NRC gave a specific example that most of the long-lived radionuclides in the repository do not transport readily through the natural systems, thus they typically do not show up as important dose contributors. However, the natural systems are risk significant because they keep the most significant long-lived radionuclides from reaching the accessible environment. The NRC also stated that if it determines that additional information is needed to support its review of the LA, it will explain why the information is needed based on its risk significance.

#### Path Forward to DOE's Submittal of the License Application

The DOE provided an overview of the path forward to resolve outstanding technical and programmatic issues prior to submitting an LA. These included addressing the KTI agreements, prelicensing interactions with NRC, and preparations for inspection oversight by the NRC's Region IV office. The NRC and DOE discussed the need to establish a preliminary schedule of technical exchanges and other public meetings through the end of 2004.

#### Continuing DOE Activities after Submittal of the License Application

The DOE highlighted activities that it would be performing subsequent to submitting the LA. These included procuring long lead items, facilitating NRC licensing reviews and inspections, developing plans described in the SAR, and implementing processes to address NRC requirements (e.g., 10 CFR Part 21).

## Proposed Conditions for a Potential Construction Authorization

The DOE stated that it was reviewing the requirements of 10 CFR Part 63 and other NRC licensing processes to identify the appropriate types of general conditions that might be imposed on a construction authorization, but, at this point, had not identified any specific conditions that might be applied. In addition, DOE is performing a similar review for items that might be proposed as possible subjects of license specifications for a license to receive and possess HLW and noted that there may also be conditions identified during the NRC safety review.

## Stakeholder Comments and Questions

Judy Treichel, Nevada Nuclear Waste Task Force, asked NRC whether the aging facility would be reviewed as part of the LA for a Yucca Mountain repository or as a separate facility. NRC noted that if the way DOE is planning to describe the repository and its operation is supported, the aging facility will be reviewed as part of the repository LA, as provided for by 10 CFR Part 63. The NRC committed to provide information that would differentiate between an aging facility at the proposed repository and an independent spent fuel storage installation that would be licensed by NRC under 10 CFR Part 72.

Steve Frishman, State of Nevada Agency for Nuclear Projects, stated that he was concerned with the concept of a “rolling SAR”. He suggested that it would be extremely difficult for both the NRC staff and other stakeholders to understand exactly what is being licensed. He recommended that the SAR should be “frozen” at some point so the review can be performed.

Charles Fitzpatrick, Attorney for the State of Nevada, Egan and Associates, questioned how NRC would evaluate SSCs that DOE has concluded are not ITS. The NRC responded that the staff would review the information provided in the LA. In the event that the LA did not appear to appropriately categorize an SSC as ITS or not ITS the staff would perform an independent evaluation and make a determination whether it agreed with DOE.

## SUMMARY AND FOLLOW-UP ACTIONS

The NRC noted that DOE appears to have made good progress since the last meeting in November 2002 on the level of detail that will be included in the LA. However, the final judgement about the adequacy of information contained in the LA cannot be made until submitted by DOE.

The following are some specific NRC observations regarding this Technical Exchange:

- Similarities exist to other NRC licensing processes (e.g., 10 CFR Part 50); however, NRC will review the Yucca Mountain LA in accordance with the requirements of 10 CFR Part 63. The DOE must ensure that the level of detail in the LA demonstrates that the proposed geologic repository meets the requirements of 10 CFR Part 63. Notwithstanding, DOE may consider applying lessons learned from previous NRC licensing activities to the Yucca Mountain LA.
- The DOE will continue to perform design activities after a LA is submitted to NRC.

- The staff does not have a clear understanding of the process and criteria used by DOE to classify and document SSCs as ITS and not ITS, or how DOE evaluates the potential items that are classified as not ITS to affect items that are ITS. The NRC recommends a public meeting be conducted with DOE to clarify concerns raised in this area. The DOE agreed.

          /RA/           Date 2/19/04 \_\_\_\_\_  
C. W. Reamer, Deputy Director  
Division of Waste Management  
Office of Nuclear Material Safety  
and Safeguards  
U.S. Nuclear Regulatory Commission

          /RA/           Date 2/19/04 \_\_\_\_\_  
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